

Compliments of the author.

B.29

J. A. McFarlin.

FORT LEAVENWORTH, KANSAS, February 3, 1875.

To the

Surgeon General, U. S. A.,

Washington, D. C.

Through Hd. Qrs. of the Post to Hd. Qrs. Dept.

of the Missouri and the proper military channels.

GENERAL: Herein please find my calculations of the nutritive value of the army ration, as far as I have means of deducing the same, in ounces and tenths of ounces:

	Total.	Water.	Albu- minates.	Fats.	Carbo- hydrates.	Salts.
Bread,.....	18oz.	7.20	1.44	.27	8.856	.234
Beef, (20 oz. 1-5 de- ducted for bone,) ..	16.02	12.00	.240	1.344	.....	.256
Rice,.....	oz. 1.6	0.16	0.08	0.0128	1.331	.008
Sugar,.....	oz. 2.4	0.072	.....	.....	2.316	.012
Salt,.....	oz. 6	.....	.....	.....	.....	.600

This is equivalent to Nitrogen 272 grs., Carbon 4736 grs., Salts 485 grs.,
Coffee oz. 1.6, Water .19, Legumin,..... .16

Caffeine,..... .0277

Nitrogenous,..... .048

Oils,..... .000048

Fats,..... .208

Cellulose,..... .54

Dextrin and Sugar,..... .24

Coffee gallate of Potash, .056

Salts, 0.106

Pepper, oz. 0.04

Vinegar, 1-100 of a gallon.

The value of other elements of the ration issued as equivalents:

	Water.	Albu- minates.	Fats.	Carbo- hydrates.	Salts.
Dry Peas, oz. 2.4,.....	.36	.528	.048	1.272	.0576
or Peas, oz. 2.4,.....	.50	.528	.048	1.272	.0576
or Beans, oz. 2.4,.....	.384	.540	.048	1.3032	.0576
Corn-meal, oz. 20.	2.70	1.98	1.34	12.90	.28 ash

Relative to tea, (its infusion,) only about 6-7 of the soluble matters are taken up by the first infusion; in it are found dextrin, glucose, tannin and theine; about 47 per cent of the nitrogenous substances pass into the infusion, and 53 per cent remain undissolved.* The wax, chlorophyl, and resin are also undissolved and lost.

*Parkes' Hygiene, page 255, edition of 1866.

COMPOSITION OF BLACK TEA.

U. S. Ration oz. 0.24

Water, estimated, oz.	0.03583
Theine,	0.00426
Albumin,	0.00643
Wax,	0.00036
Chlorophyl,	0.00514
Resin,	0.00598
Tannic Acid,	0.03782
Etherial Oils,	0.00181
Cellulose,	0.05436
Dextrin,	0.02328
Extractive Matters	0.04984
Apothema,	0.00187
Ash,	0.04984

In tabulating the articles of the ration specified on the first page of this communication and comparing the water-free solids therein, with what Moleschott and Lyon Playfair give as the food required daily by a working man of average height and weight, I find as follows:

AMOUNT IN OUNCES AND TENTHS OF OUNCES.

	Albuminous Substances.	Fatty.	Carbo- hydrates.	Salts.
	oz.			
Moleschott,	4 587	2.964	14 257	1.058
Playfair,				
Adult in active work, . . .	5.500	2 5	20.	0.9
“ “ laborious work	6.5	2.5	20.	0.9
Average of the above,	5.5	2 6	18.	0.979
U. S. Army ration,	3.92	1.6	12.5	1.11

The English soldier on home service takes daily in quantity, oz. 65.

“ American, oz. 40.

“ English soldier, Bread oz. 24, potatoes and other vegetables. 24 oz., milk, 3.25 oz.

The American, Bread 18 oz., being deficient in vegetables and devoid of milk.

Professor Parkes states that the English ration is defective in albuminates, very poor in fats, in excess in starch, sufficient in fresh vegetables. “It would be improved,” he says, “by the addition of more meat—12 oz. is issued—or what would perhaps be better two ounces of good cheese; by some fatty food, such as bacon, butter, or by a greater use of oil in cooking. (an excellent way of getting fat into the system,) and by a larger employment of beans and peas. The accessory foods are rather deficient, and vinegar especially should be used.”

In my opinion, potatoes, milk and cheese (or butter,) could be advantageously added to our ration.

In other services the ration is increased under certain circumstances. The Prussians have a ration “for time of peace,” “for the march,” and “for war”—the greater war-ration; again, in the war in Schleswig, in 1864, the meat was doubled on field days.*

*Parkes' Hygiene, page 156.

It is preferable to add a new element, rather than double any one, and thus gain in variety—an important consideration at all times.

I desire to invite attention to certain conclusions announced by Dr. Edward Smith, F. R. S., in his Report on the Food of the Poorer Laboring Classes in England, in 1863, viz:

* * * * *

“5. The abundance of meal, potato and milk, which is obtained, is of the greatest value.

* * * * *

7. The general introduction of tea and coffee, into the western part of the country, is to be deprecated, since it would not only lessen the economic value of the foods, but would lead to the diminished use of the highly nutritious milk.

8. The introduction of meat in greater abundance would be desirable as indicating an improved condition of the populations—one above that of constant peril from want—but is not necessary for the maintenance of health and strength, so long as a good supply of potato, meal and milk exists.

* * * * *

*10. The amount of fluid taken into the body in the potato and milk dietary is enormous, so much as 10 lbs. daily in the full dietary.

11. In the present state of low wages of these populations, the abundant use of potatoes is most desirable, *except in those cases where potatoes are bought*; and no attempt should be made to lessen it, unless by increase of wages, and the introduction of wheaten bread.

12. The use of Indian corn-meal can only be a temporary expedient, if the condition of the laborer should continue to improve, since notwithstanding its real economy, it is distasteful to the people.

* * * * *

17. The increase of the cottage garden system, whereby the laborer may profitably occupy his spare time in the production of a larger quantity of potatoes or other foods, would be of material benefit.”

The above extracts relate to farm laborers of Ireland who generally “have *either* Indian-meal * and oat-meal stir-about, with milk, three times a day, or, *when potatoes are plentiful*, they have two meals of potatoes and milk, and one of stir-about and milk, or they have potatoes at all the meals.” The allowance, when the quantity is limited, is 10½ lbs. of potatoes and three pints of milk daily.

In Dr. Smith's Report upon the Food of Farm Laborers in Wales, he says:

“2. They eat a large amount of breadstuffs and milk, with a moderate quantity of sugars and fats, and a small quantity of meat, * in Augbury and North Wales.

*Note.—At page 217 in the beginning of his Report, Dr. Smith says: “In some instances, however, I was enabled to obtain alternative dietaries, as in Ireland, where at one season maize, and at another potatoes, is exclusively eaten.”

3. Cheese is eaten largely in South Wales, and with bread is there the staff of life.

7. South Wales is remarkable also for the very small quantity of meat and separated fats eaten, and for the many families who never obtain them, and proves that much health and strength may be maintained by a dietary of breadstuffs, milk and cheese. I have been exceedingly struck with the healthy appearance of most of those who most rarely eat meat or bacon."

In Scotland oat-meal, potatoes and milk are more generally consumed than bread and meat. Cheese was eaten by 45 per cent of the populations.

12. Cheese was eaten on the whole average (of England, Scotland, Wales and Ireland,) in quantities of 5 oz. per adult weekly. In England the amount was 5.4 oz.; in Wales, 9.4 oz.; in Scotland, 2½ oz., whilst it was not at all obtained in Ireland.

It is to be remembered that these investigations distinctly refer to the *food of the lowest fed classes*. The general comparison of the whole shows that "there was the most nutriment, the least sum spent upon food, the most breadstuffs and milk, the least sugar, fats, meats, cheese and tea in Ireland. There was the least amount of nutriment, the greatest variety of foods, the least quantity of breadstuffs and milk, the greatest quantity of sugars, fats and meats in England."*

Potatoes, (in Ireland,) *when the season arrives at which they are plentiful*, commonly supplant every other farineaceous food, and with butter-milk constitute the sole food of the peasantry. In this case the quantity allowed at a farm-house is 3½ lbs. twice a day. * * They are cooked always in their skins, and almost always by boiling, * * each person peels the potatoe, * and dipping it in the salt eats it. Butter-milk or skim-milk which has become sour, is eaten or drunk by mouthfuls at the same time; and in several instances a very small quantity of butter is placed in a vessel into which some of the potatoes are dipped. There can be no doubt that potatoes are a most highly prized food amongst the laboring population of Ireland, and one in which they indulge as largely as the supply and the enlarged capacity of their stomachs will admit of; and I was desirous to ascertain whether this large and universal use of potatoes resulted from enjoyment of that food, or from a belief in its superior nutritive and sustaining qualities. I therefore asked the question of the farm laborers, universally, and of the educated classes, when I had the opportunity. In reference to the first question there can be no doubt that one cause of preference is the enjoyment which they furnish, and particularly when their softness, and the sweet flavor, is contrasted with the harsh taste of the Indian corn. So much is this the case, that no kind of farineaceous food—but fine wheaten flour—could compete with it, and if this could be readily obtained, (without the additional luxuries, which would be purchased by any who could obtain fine flour,) it would

*See 6th Report of the Medical Officers of the Privy Council, with appendix, 1863; page 293. [Public Health, 8034.] London: Eyre and Spottiswoods, 1874.

probably not greatly diminish the consumption of potato, by those already accustomed to its use, but would be preferred by the younger members of the family, as their tastes became adapted to it. The second question was answered variously by different persons. The educated classes for the most part affirmed that a laborer could work better upon meal than upon potato, but their judgment was not based upon personal experience. The laborers themselves, however, differed upon this question, some asserting that *they could work better upon meal*, whilst others, and *by far the larger number*, affirmed *that they could work better upon the potato*.

But added to these considerations must be the fundamental one, that *the potatoes scarcely cost anything*, in many instances, and thus allowed money to be expended upon other necessities, and where the sole object was to live, this must ever have great influence over the judgment. The largest quantity of potatoes eaten by any family was by case No. 611, where 441 lbs. were eaten weekly by the family, and 70 lbs. by each computed adult. * * * To show in detail the effect of the change (*by an alternative dietary*,) upon the quantity of nutriment supplied in the following table, (he says,) I have cited the cases in which this is recorded in my notes, with the quantities of potatoes which would be eaten, instead of a given quantity of meal, which would be intermitted. In several of the cases, moreover, sugar was intermitted with the meal, and in others butter was added, with the potatoes, and the nutritive values of these foods have been added accordingly.

The table shows the loss or gain in nutriment with the use of the potato.

POTATOES VERSUS MEAL.

[See Report of Dr. Edward Smith, F. R. S., on the Food of the Poorer Laboring Classes in England. page 287.]

No. of case.	Potatoes, Pounds.	Carbon with Potato. Grains.		Nitrogen with Potato. Grains.		
		Loss.	Gain.	Loss.	Gain.	
590	294	.....	27 100	2.618	.....	Includes sugar.
591	147	9.016	.....	2.280	.....	.....
592	189	90.353	.....	5.615	.....	.....
594	392	11.700	.....	6.104	.....	.....
595	168	105.965	.....	6.108	.....	.....
597	98	120.600	.....	6.154	.....	Includes sugar.
598	98	120.540	.....	6.189	.....	Includes sugar.
599	294	.....	19.180	1.367	.....	.....
600	196	.....	44.520	.....	533	.....
601	98	.....	56.260	.....	719	.....
602	392	17.360	.....	4.040	.....	.....
605	294	56.420	.....	4.662	.....	.....
609	127	82.810	.....	4.919	.....	.....
610	392	.....	71.680	7.609	.....	.....
611	441	52.460	.....	.....	4 532	Includes Butter.
617	147	4.410	.....	1.738	.....	.....
618	294	.....	10.780	2.492	.....	.....
624	147	82.810	.....	6.069	.....	.....
627	220½	7.815	.....	.....	340	.....

Hence in a large majority of the cases there was a loss of nutriment when potatoes were substituted for meal, and in some instances the loss was so enormous as upwards of 100,000 grains of carbon and 6,000 grains of nitrogen weekly. The gains are also sometimes nearly as large, and when they have been deducted from the loss, it leaves a total average loss for each family weekly of 29,619 grains of carbon and 2,938 grains of nitrogen, and about 1.5 of those quantities for each adult weekly. When this total loss is averaged for the whole number of cases included in the enquiry it will require a deduction of 2,384 grains of carbon and 236 grains of nitrogen for each adult weekly from the general average, stated to occur at page 68 when meal was used, during the period of the intermission in the use of meal.

The diminution in the quantity of potatoes obtained by these populations (Ireland,) since the potato famine has almost universally restricted the use of them in food to a portion of the year. It has also prevented the laborer obtaining money by their sale, and perhaps above all, it has prevented his rearing, feeding and eating his pigs.

Reverting to a previous part of this report of Dr. Smith, he says: *

* The quantity of potatoes grown by the laborer in the North of Scotland has not been so great since as before the occurrence of the potato disease. Previous to that event the peasantry of that part of Scotland, like those of Ireland, obtained potatoes sufficient, with the addition of milk, for almost all their wants, and thus saved the expense of oat-meal and other breadstuffs. * Moreover the abundance of potatoes enabled them universally to rear and feed one or more pigs which were usually killed for their own consumption. The lessened supply of late years of an article which cost them little but their labor, has caused them to spend money over breadstuffs and has either prevented the feeding of the pig or has required it to be sold instead of being eaten by the family. Hence the loss of the potato in the Highlands of Scotland is felt by the laborer to have been a calamity almost as great as in Ireland, and indeed the similarity in these conditions of the same class in both countries is very striking. The belief of many persons, as in case No. 557, is that a portion of both potatoes and oat-meal is better than any quantity of either alone

In several cases I obtained the *alternative dietaries*, with and without potatoes. * I will here state the relations of the nutriment contained in the two foods in the substituted quantities:

Case No. 557—substituted 35 lbs. of oat-meal for 168 lbs. of potatoes.

The oat-meal contained carbon, 96,250 grs.; nitrogen, 4,900 grs.

“ potatoes “ “ 129,360 “ “ 4,104 “

Case No. 562—substituted 35 lbs. of oat-meal for 196 lbs. of potatoes.

The oat-meal contained carbon, 96,250 grs.; nitrogen, 4,900 grs.

“ potatoes “ “ 150,920 “ “ 4,802 “

Case No. 563—supplanted 24½ lbs. of oat-meal by 196 lbs. of potatoes.

The oat-meal contained carbon, 67,295 grs.; nitrogen, 3,430 grs.

“ potatoes “ “ 150,920 “ “ 4,802 “

Case No. 564—supplanted 14 lbs. of oat-meal by 98 lbs. of potatoes.

The oat-meal contained carbon, 38,500 grs.; nitrogen, 1,960 grs.

“ potatoes “ “ 75,460 “ “ 2,401 “

Hence in each of these instances there was a considerable increase in the carbon supplied by the potatoes, and in the two latter there was a considerable increase in the nitrogen also.

From the above statement it appears that—

One pound of oat-meal contains carbon, 2,750 grains; nitrogen, 140 grains.

“ “ “ potatoes “ “ 770 “ “ 24½ “

And elsewhere in the Report it appears that—

One pint of skim milk contains carbon, 436½ grains; nitrogen, 43½ grains.

“ ounce of tea contains scarcely any carbon, and only of nitrogen 10 grs.

In alternative dietaries, so far as practicable, reference should be had to the nutritive values of the articles interchangeable with each other, as best expressed in a classified list, showing what articles are interchangeable when circumstances forbid the procurement and issue or the transportation of any one or more of them; and showing also in what quantities they relatively may be substituted for each other upon the basis of *nutritive value*, (**and not as at present*); preference being always given to fresh fruits over dried; to fresh, succulent vegetables over any desiccated or dried or stale vegetables; to fresh beef over pork; to soft, fresh bread over hard bread, and rating such articles as potatoes, beans, peas, hominy and rice in the order of value and excellence as elements of food.

In certain military departments fruits and vegetables can readily and perhaps as economically be obtained by purchase, and whenever practicable they should be selected and obtained as near as may be to the troops to be supplied, and from time to time as needed, if their freshness be of paramount importance.

Dietaries should differ in accordance with the requirements of climates and of seasons in the same climate. They should vary in some respect every day.

Due regard should be had to economic considerations, but cost should not prevail over others more important. It costs a goodly sum to recruit, to transport and subsequently create out of the raw material a trusty and instructed soldier, and all that sum is wasted if he be not preserved to the service and for duty.

There is a natural variation in populations generally “in the kind of food to be obtained according to the season of the year by which new elements of dietary are introduced and old elements are in part or wholly displaced. Such for example as the production of vegetables and the abundance of fish, and also in a less degree the abundance and consequent cheapness of butter and milk.” Seasons also influence the propriety of the use, if not the abundance of game, and in this connection it occurs to me that we know not how largely game when in the field and gardens when out of the field in garrison, minister to the comfort, the

*See Table III, Nutritive Values of Food, in Dr. Letheby's Cantor Lectures on Food, p. 5.

contentment and the health of the soldier and combine to retain him in the service. They are contingencies which are very material to him, though they are (independent of governmental influence,) the fruit of his own hands.

Fortunately, in some respects, the soldier's duties are chiefly out-door rather than in-door. He experiences, however, great vicissitudes, as when he walks his post under the blazing sun near the tropics, or exposed to the pitiless storm wind of a Northern winter. With these extremes, to preserve a proper temperature of the blood and of the body, almost as great regard should be paid to diet as to clothing. The Esquimaux consumes fat, blubber and train oil, as they maintain best his bodily heat. The tropic native, or the African, is equally attracted to cooling acescent fruits as refrigerants.

Returning to Dr. Smith's Report, (page 227,) on the food of the *lowest fed classes*, and particularly the stocking and glove weavers in England: "In no family was bread bought in quantities to supply the wants of the family, but only in small quantities to supplement that which they had baked. Hence the purchasing of flour and the making of bread at home were universal. The quality known as seconds. Oat-meal was eaten in three-fourths of the cases, but only in quantity sufficient to make (oat-meal) gruel. The rice was used to make puddings, and the peas to make soup. The total average quantity of breadstuffs reckoned as bread was 11.9 lbs. per adult weekly." [1 lb. 14 oz. per adult daily.]

This, I remark, is compared with the U. S. Ration, a large one, but even at that rate the families could not afford to give 33 per cent flour to the baker as the soldier does to go to the post fund. They had to find time for baking their own bread.

"A majority of the persons referred to had small gardens or plots of potato ground in 'cottage gardens,' and hence the use of fresh vegetables was universal. The average quantity of potatoes then in use was 4 lbs. per week for each adult. [9 1-7 oz. daily per adult.] Butter was procured by every family in weekly quantities varying from $\frac{1}{2}$ lb. to $3\frac{1}{2}$ lbs. Lard or dripping was consumed by 9-21 and suet by 15-21 families. The total average quantity of fats eaten was $18\frac{1}{4}$ oz. per family, or $3\frac{1}{2}$ oz. per adult daily. * * * The total average (*butcher's* meat or *bacon*) of meat was nearly $3\frac{1}{4}$ lbs. per family, or $\frac{1}{4}$ lb. per adult weekly. * * * Cheese was used in every family, except one, at the rate of $\frac{1}{4}$ lb. per week. Eggs were procured in more than half the cases, and in many instances from their own fowls."

The cost was (of the food) 2 shillings 6 $\frac{1}{2}$ pence per adult on the average, and the quantity of carbon and nitrogen obtained for each shilling, 13.296 grs. and 522 grains. Four meals a day were usually eaten.

Among the farm laborers in England "onions are used very extensively, and give a savory relish when bread is the chief article of which the meal is composed, as well as when a little meat is cooked. They have the advantage over other kinds of green vegetables, that they may be eaten whilst growing, and also preserved for use in the winter." * * *

"The tables will show also that the places where skimmed milk was plentiful and cheap were those in which the largest amount of nutriment was obtained in relation to its cost, and nothing can be so important to the laboring classes as an extension of facilities for obtaining a plentiful supply of this cheap and most important food. The use of butter-milk as an article of human food in England is much too small when its nutritive value, small cost and large supply are considered. * As cheese is used practically as an equivalent for three articles of food, viz: milk, butter and meat, and to supply a deficiency in any or all of them, it is much to be regretted that the cheap form of cheese is not more widely attainable, for although it may not be so easy of digestion as the cheese which is richer in fat, it is itself richer in nitrogen than any other article of food, and when just made, nor more than one year old, may be eaten without disadvantage. It is the cheapest mode of obtaining nitrogen, excepting skim-milk and butter-milk costing $\frac{1}{4}$ d. per pint. Cheese was eaten in every county, (of England,) but in only six counties by every family under enquiry. * * * "The total average quantity supplied was 24 oz. per family and $5\frac{1}{2}$ oz. per adult weekly. * * In the "districts where the cheap cheese is largely used, the laborers commonly "obtain it, by a cheese at a time, from their employers and pay for it by "instalments. In these districts it is regarded as an inferior food, and is "eaten by those who are too poor to obtain meat; whilst in others, as in "Yorkshire. it is regarded as a luxury, desirable but not necessary, and "beyond the means of the purchaser. The former are among the poorest, the latter among the richest on the dietary which the laborers obtain."

The use of tea is general in England among the poor, not as a nutriment so much as because it supplies a hot drink of agreeable flavor when sugar and milk are added, is easily made, supplies the fluid needed by the system, and diffuses an agreeable warmth in cold weather, and therefore figures in the poorest dietaries; "but when the *infinitesimal* nutriment "which is contained in one ounce of tea, costing 3d, is compared with "that in 12 pints of skimmed milk, costing in Devon the same money, it "is a matter of regret that the latter should not be more generally attainable, and be universally used by the poor."

The meals of a laborer in a farm-house in Devon are given to *illustrate* the arrangement of foods in the meals (p. 254.) Breakfast and supper: Bread and milk, or bread and clotted cream, followed by fried potatoes and boiled milk, and plum pudding, or bread, cheese and cider, or cold meat four or five times a week. Dinner: Always hot meat, (mutton, pork, or bacon,) with vegetables and bread, and milk and flour pudding, (suet is never used.) The meat is sometimes baked over the potatoes. The pudding is cooked only at dinner time, when it is eaten hot, and the remains of it are eaten cold at the other meals. The farmer estimated that each person ate $1\frac{1}{2}$ to 2 lbs. of raw meat, 1 lb. of flour, 5 oz. of bread, and $1\frac{1}{4}$ pint of skimmed milk, besides other food daily. * * Notts Wilford: * * The farmer estimated that each man ate daily 7-8 pint of milk, 1 lb. of uncooked meat, $\frac{1}{4}$ lb. of bacon and a pint of ale, besides

bread, flour, vegetables and cheese. Cheshire, Macclesfield Forest : Breakfast : Milk-porridge and bread, with coffee, tea, and bread, butter or cheese. Dinner: Suet or preserve dumpling or pudding, meat and potatoes, daily. Tea: Bread, butter or cheese. Supper: New milk, bread and cheese, or a little cold meat. * * Cumberland: * * Each man takes four meals a day, and among other articles "about 4 pints of milk, $1\frac{1}{2}$ lbs. of cooked meat and 2 lbs. of bread daily." * * * Milk was obtained by every case in Anglesey, North Wales and South Wales; 83 per cent obtaining butter-milk, 53 per cent skimmed milk and 6 per cent new milk. Those who possessed a cow always made butter, and sometimes also cheese from the milk, and hence did not drink new milk.

The quantity of cheese consumed in Wales is larger in winter than in summer, except the harvest season. One family of three persons in South Wales, (No. 525,) ate so much as 14 lbs. of cheese weekly, (p. 270)

Cheese, according to Parkes, "contains a very large amount of nitrogenous matter in small bulk, and as it is agreeable to the palate, it must be an excellent food for soldiers in war. About $\frac{1}{2}$ lb. contains as much nitrogenous substances as 1 lb. of meat and $\frac{1}{3}$ d. of a pound as much fat." As it does not keep so well in hot climates, it could be issued at our northern posts and stations, (particularly also where from any causes milk or butter are too costly or difficult to procure,) and by its small bulk would especially be eligible for transport by troops in the field; or to supply a deficiency in milk, butter and meat there or elsewhere. To appreciate the nutritive value of cheese, I arrange the following table, in ounces and tenths, to which I will add a few other articles I have referred to elsewhere:

	Water.	Albuminous Substances.	Fatty.	Carbo- hydrates.	Salts.	
Cheese, 2 oz., -	.73	.77	.48		.108	Parkes'.
Butter, 2 oz., -	.14	.06	1 82		.054	
Milk 1 pint, 90 per cent water and 10 per cent solids, -	.90	3.	2 5	3.9	.5	Letheby.
Milk, 16 fluid ozs., -	13.968	casein .576	butter .576	sugar .752	.128	
Potatoes, 12 oz. -	8.88	.18	.12	2.80	.120	

Although the necessity for the production of animal heat is greatest in winter, it is not my opinion that cheese is only adapted to Northern climates only, but in some degree in the winter of all climates of the United States, it may be used with benefit as a calefacient and nutrient, and to give variety to diet. It may be difficult to store cheese in hot climates, but if suitably prepared and packed, (in salt,) the Army could receive it shipped from the North at a proper season. It could be stored in cool cellars, could be purchased as needed, if preferable, to avoid loss to the Subsistence Department. Referring to the exhibit of the Navy ration for each day of the week, as given by Medical Director Joseph Wilson, U. S.

N.,* I find pork is issued on Mondays, Wednesdays and Saturdays, and beans on the same days. Tuesdays and Fridays flour and dried fruits. The dried fruits on some stations are usually raisins; on other stations dried apples, and occasionally prunes, dates, figs, &c., are issued. Biscuit, sugar, tea, or coffee, or cocoa daily. Beef Tuesdays and Fridays. Preserved meat Sundays and Thursdays. Rice on Sundays. Pickles on Wednesdays and Saturdays. Desiccated potato and molasses also on Thursdays. Butter on Thursdays and Sundays. Vinegar on Saturdays. This gives a variety to the diet at sea, and when the ship arrives in port fruits, fresh vegetables, mustard, pepper, &c., are purchased from the mess fund. In port fresh soft bread (and I suppose fresh meat and other articles) are procured. Dried apples are substituted for raisins sometimes, made into dumplings and pies with flour and seasoned with molasses. Prunes, pears, peaches, &c., are also occasionally substituted, the regulations wisely permitting such substitution when convenient. Dr. Wilson recommends cranberries highly to the attention of the naval service, and adds that the Navy is exceedingly fortunate in having the butter and cheese packed in such a way that they are kept with comparatively little deterioration or loss.†

In our service there does not appear to be sufficient attention given to ensure in the companies, as far as practicable, a diet to vary with different days in the week in any one season. A well arranged issuing table, as a guide to the company cooks, in time might accomplish something in this respect. At this post fresh meat is issued about seven days and salt meat (bacon) about three days in every ten days. Fish should be served at least once a week, and Friday is the proper day as suiting best the fancies or creed of these men. Dr. Wilson states that the best preserved fish he had ever seen on ship-board "were herrings, which had been salted a little, just as much as is required to give fresh fish a proper flavor; smoked a little, just enough to be perceptible; dried a little, probably in the process of smoking; trimmed of superfluous parts, heads, tails and fins, and packed in small tin boxes, with oil, in the manner of sardines." The Hebrews, I believe, cook fish in oil or butter, (spices are also added,) to avoid the use of pork in cooking and to improve them in flavor.

I think the row-herring of the Potomac river, one of the varieties of fish most relished, and on account of its cheapness, an eligible article of diet. The row adds largely to its nutritive value. When slightly salted and smoked and properly cooked it is very appetizing. Fresh fish are, when procurable, to be preferred.

For the field a properly prepared meat sausage would be a valuable element of subsistence—when fresh meat cannot be had. Yet the experience of the celebrated *pea-sausage* in the Saxon army in the late war was such as to indicate caution in recommending it as an article of issue in our service. "If it was used too exclusively the men turned against it.‡

*Naval Hygiene, chapter VIII, p. 48.

†Ibid, page 56.

‡See Report on Hygiene for 1871 by E. A. Parkes, M. D., F. R. S., Professor of Hygiene in the Army Medical School. Army Medical Department Report for 1870, p. 234—London. 1872.

In fact one of the greatest difficulties was the too great uniformity of the food. To do away with this, bacon, preserved and smoked meat, peas and white beans, and potatoes, when possible, were issued as a change of diet. Independent of these *extra issues*, the daily

GERMAN WAR-RATION

was as follows in English weights—(daily):

	Bread,.....	26½ ounces, or Biscuit 17 ounces.
one	{ Fresh or salt meat,.....	13 “
of	{ Salted beef or mutton,.....	9 “
these	{ or Bacon,.....	5½ “
	Rice,.....	4.4 “
one	{ Barley or groats,.....	4.4 “
of	{ Peas or beans.....	8.8 “
these	{ Flour,.....	8.8 “
	Potatoes,.....	3.3 lbs.
	Salt,.....	7 oz.—0.7
	Coffee, { of unroasted,.....	7 oz.—0.7
	{ or of roasted,.....	1 ounce.”

Computing the nutritive value of the following elements in the above, it is found to be—

	oz.	Water.	Albu- minates.	Fats.	Carbo- hydrates.	Salts.
Bread,.....	26½	10.60	2.12	.390	13.035	.344
Fresh meat,.....	13	9.75	1.45	1.092	.....	.208
Rice,.....	4.4	.44	.22	.035	3.66	.022
Beans,.....	8.8	1.64	1.98	.176	4.78	.211
Potatoes,.....	53.33	39.46	.79	.053	12.479	.533
Salt,.....	7	.....	.....	.....	.....	.700
.....	.....	61.89	7.06	1.746	33.95	2.019
oz. 44.77 water-free solids.						

Total,.....oz. 106.66

Sugar is not mentioned or included in this ration which is particularly rich in Bread, Rice, Beans and excessive in Potatoes. I have not included the coffee in my calculation of its value.

Substituting Beans for Rice in the U. S. Army Ration, I find its nutritive value to be—

	Total.	Water.	Albu- minates.	Fats.	Carbo- hydrates.	Salts.
Bread,.....	oz. 18	7.20	1.44	2.70	8.856	.234
Beef,.....	oz. 16	12.00	2.40	1.344	.....	.256
Beans,.....	oz. 2.4	.45	.540	.048	1.3032	.0576
Sugar,.....	oz. 2.4	.072	.....	.....	2.316	.012
Salt,.....	oz. .6	.....	.....	.....	.....	.600
.....	oz. 39.4	.....	4.38	1.662	12.475	1.1596

Water-free solids, 19.676 oz., which is equivalent to 304 grs. of nitrogen, 4217 grs. of carbon and 507 grs. of salts.

The nutritive value of some other diets I arrange here for comparison:

That of a man weighing 141 lbs. while at rest,	Carbon, 4152 grs.	Nitrogen, 198 lbs.
The same during exertion,	“ 4841 “	“ 395 grs.
That of the Lancashire opera- tives during the cotton fam- ine of 1862,	“ 4588 “	“ 215 “
U. S. A. Ration as at present, rice being issued instead of beans,	“ 4736 “	“ 272 “
Ration of the British soldier,	“ 5163 “	“ 298 “
Ration of the U. S. soldier dur- ing the Rebellion, 1863,	“ 5360 “	“ 339 “
The German War Ration in the Franco-Prussian War, 1870,	“ 7224 “	“ 490 “

There seems to be a general impression entertained that the U. S. soldier is liberally supplied, which is erroneous. He tires of the unvarying diet, no doubt; and may have a residue left, especially when from the supplies of his garden when in barracks, and of the chase when in the field, he obtains the quantity to satisfy him and the variety he needs. A reference to the preceding table confirms this. When from any cause he does not receive the full nutritive value of his ration and an extra supply of vegetable food, (not supplied by Government,) the soldier very rapidly runs down in condition. Especially is this true on campaign against an enemy where the labor and watchfulness are intensified. During the war of the rebellion, when vegetables could not be issued, (although authorized by law,) a scorbutic taint, dyspeptic and diarrhœal diseases very soon affected the troops. This occurred in the Army of the Potomac after thirty-two consecutive * days of marching and fighting in May and June, 1864. This, too, notwithstanding that every attention had been given by the commissary and medical departments to the health and nutrition of the men during all the preceding winter and spring.

If our troops are to be on campaign, they should receive a proper war ration—fresh fruits and vegetables, or dried fruits and articles convenient for transportation, such as cheese, canned milk, butter, canned meats, and canned vegetables should be authorized and added.

At the same time in view of the importance, we do not adequately recognize, in maintaining the present standard of health of the troops in garrison of the yield of company and post gardens, their existence should in every way be fostered and whenever possible they should be required by the strongest orders to be cultivated by the troops, and where the rivers contain fish, suitable for consumption as food, fish should be regularly caught in adequate amount. In all this the Government should defray the expense and provide the facilities needed.

When gardens are cultivated cows can be kept (the necessary forage for winter being supplied.) Fowls and eggs also can be furnished to the companies. The commissary department has heretofore, in a most commendable spirit, sent up a certain number of milch cows and a bull, in the cattle herds, driven to distant stations, remote from all settlements,

*See Medical and Surgical History of the War, (Medical Volume and Appendix.) Part I, pp. 148 and 161.

and where otherwise milk could not be obtained. This did not involve any loss to the Government, as the cattle were ultimately disposed of to the best advantage, either by sale or slaughter. When we consider the indispensable necessity for milk as a nutriment to very young children and such as are still growing - milk containing all the elements for nutrition and for growth, it is not difficult to see, that in its absence human life will be sacrificed at some stations in the mid-summer seasons. These will be the children of such in the garrison, as are unable for any reason to keep a cow.

Many causes in England conspire to keep the poor man from obtaining milk in any form - either new milk, butter-milk or skim-milk - as in the dairy counties where butter is made, in the districts where cheese is made, or those bordering on great towns, where it is sent to town and reserved for customers, or even where it is sold in the country, a favored few are supplied only. In some instances the farmer finds it a trouble to serve the skim-milk to customers, the dairy-maid being needed for other work and the mistress thinks it below her position, and hence he gives it to his calves, pigs and hounds, and refuses it even to his own laborers. Dr. Smith found families who had not been able to obtain milk for two years, and where, in consequence, the health of the children suffered (p. 250.) On this he remarks: "It is of the greatest importance that milk - in one of the forms of new milk, skimmed-milk or butter-milk - should be more universally attainable, and that the health of the working man should not be thought of less consequence than the welfare of calves, pigs and hounds. The sale of milk is positively a monopoly, since the poor cannot procure it for themselves, neither can they go to places distant from their own village to buy it. Hence a deep moral responsibility rests upon the farmers who have it and refuse to sell it to the poor." (p. 264.)

I have made very extended quotations from the above report, but it has seemed to me they were pertinent to the present enquiry relating to laboring classes, for whom it was necessary at all times to procure articles of food at such rates as to be within their means, yet of such value as to be salutary and enjoyable. To show these facts copious extracts were unavoidable.

To exclude from the dietary of military populations, as by inattention or for reasons of more or less force to those in authority, may seem conclusive; so wholesome, so agreeable, and indispensable an element as milk in some form is found to be by all nations, at all times, is unwise. Perhaps I should say, it is strange, considering military communities comprise so many of the very young and the very poor, that so little encouragement or effective aid is extended by Government in this and similar particulars. It would therefore be an argument for the more general use of milk in the army, independent of its own excellence and cheapness, that its greater demand would largely augment the supply and incidentally facilitate its procurement by very many others, who may now be without the means of obtaining it for themselves, or their families.

Cheese and butter stand nearly in the same category as milk. Every community, and almost all classes, even the very poor, use them. To add them to the ration of course involves a little expense; if not procurable otherwise, let the troops pay for them. They need them, or some other equivalents, in addition to the ration, and I know of none better or cheaper. At all events, inadequate as the American army ration is now shown to be, so little in advance or removed from what was termed in England a "famine diet," (that of the Lancashire laborers and others in 1862,) it certainly does not admit of any "savings" being expended in anything but food; nor does it become the Government by its regulations to divert any part or saving by bakeries of the soldier's flour to constitute a post fund, which contributes nothing to his food. If the bands and libraries are dependent entirely on such a fund, and can be kept up in no other way, (which is not clear, nor proven by proper effort,) then better let them disappear.

The saving on cooking flour into bread for the different large armies in the field during the war, must have been immense; this large saving was not necessary, neither was it expedient to keep so much of the ration from the veteran in the field, hard pressed as he undoubtedly was. Still more unjust was it to convert it into money and put it back into the hands or the vaults of the Government.

Until more bread or flour be authorized by law or regulation, the soldier should receive all that is baked, and should eat it. The expenditures of companies in the purchase of flour indicates that they do not get enough.

In the issuing of beef, notwithstanding the terms put in the contract, unless supervision be exercised, the soldier is liable to be served badly, in the interest of somebody else. It is certainly not contemplated that choice cuts be taken off; the quarters should be of good meat and, if possible, be entire. Even when this is done, a considerable part of the issue is not equally desirable or digestible, and much of it is bone. Professor Parkes indicates the practice in the British service of deducting one-fifth for bone, or 20 per cent. Some deduction, and that a fixed one, should be made; and to show the propriety of some attention to this matter, I will state that here recently when so much attention was being given to the inspection of company cooking and meals generally, (some time in January,) an issue was made to one company of 32 pounds of beef; complaint was made of its character, and there were found 15 pounds of bone and 17 pounds of meat in the 32 pounds issued, being at the rate of over 46 per cent of bone.

The gardens, in their yield of potatoes, onions, carrots, cabbage and other fresh vegetables, keep the Army at present from scorbutic taint; * and where no gardens exist, the purchase of them out of company savings contribute to this exemption. In the field these agencies cannot be depended upon; and the probabilities are that only short rations (beef,

*Company F, 5th Infantry, averaging 50 men: at this post, has used in the past three months 1150 pounds of fresh onions, besides potatoes, pickled beets, cucumbers and dried fruits, peaches and apples. The average use of the onion in the above is 4 oz. per man per day.

bread, sugar, coffee, &c.,) will be carried, because of limited transportation. That this cannot safely be done experience has shown in the Army, and has been corroborated during the siege of Paris. Professor Delpech * in his paper on the causes of the appearance of scurvy there concludes: that over-crowding nor cold, nor humidity excited any causative action in its production. Scurvy showed itself among persons abundantly provided with fresh meat; and none of the cases observed by him were nourished habitually with salt meat. The sole condition which was met with in all the observations was the want of fresh vegetables in the food. It is then correct to consider the suppression of the vegetable aliment as having been (among persons mostly, though not all, enfeebled by other conditions.) the only true cause for the development of scurvy.

Surgeon General Gordon, of the British Army, who was on special duty in Paris during the siege, states that there were large stores of preserved meat in tins in Paris, but that after being used for some time, this food ceased to satisfy. A feeling of hunger was constant, and the power of resisting cold and withstanding fatigue was lessened; dyspepsia and acidity were complained of, and emaciation took place in all. †

Even taking this statement, with some reserve, as not conclusive against the utility, in some degree at least, of preserved meat, I see no escape from the conclusion of the indispensableness of fresh vegetables, and that we cannot too soon return to the war ration which embraced potatoes, (a valuable anti-scorbutic,) or other fresh vegetables. The use of the onion (about 4 oz. daily) is particularly to be encouraged perhaps next after the potatoes; it being an excellent addition to soup, to the hot hash made with meat and potato; and with potato, salt, vinegar, pepper and a little oil, it makes a good salad at short notice; any unused cooked potato being thus served up again, if necessary. I am not aware that scurvy ever appears among persons who use fresh milk largely as a food.

Letheby states that the food of man should be more concentrated than that of the lower animal, and that he acts wisely in eating flesh and fat, which are the very essence of food, for he thereby economises labor, and employs the assimilative powers of other creatures to bring the crudest materials into a nutritious and highly digestible form. It is true that man, in common with the other animals, is able to convert starch and sugar into fat, and the lower qualities of vegetable albumen into flesh, but by so doing he locks up in it twice and a half the potential power of sugar and starch; and in that of flesh, he concentrates, to an unknown extent, the energies of albumen in the several constituents of muscle and its juice. ‡ Hence, the use and popularity of bacon (in its relative large amount of fat) among the laboring classes. It improves also the value of substances which are rich in nitrogen, as eggs, veal, poultry, beans and peas.

*Ann: d'Hygiene; pub. 1, Avril, 1871.

†British Army Medical Department Report. Appendix to Report for 1870, (Prof. Parkes' paper, page 236.)

‡Cantor Lectures on Food, page 101.

Fat, in some shape, as butter, lard, suet or dripping is universally needed and consumed, and I profess a decided preference for butter. It is difficult, says Letheby, "to say how much is really required for the human system, but looking at the proportion in milk, which we may regard as a model food, it would seem to be not less than 28 per cent of the "dry, solid matter of food."

When bacon is not used, butter suggests itself by the consent of mankind as a proper addition to and accompaniment of the food, and I trust it will be ere long a constant article of aliment (on beef days) for the soldier. Butter will also generally be desirable to supply fresh fat, on account of its fine flavor, its freshness, and for the reason that however well preserved any fat meat may be, the stored fat is prone to become rancid, if not already somewhat advanced in that direction, which is particularly noticeable in the South American dried meats as used by the natives, and at times in bacon. In order to provide for the health and vigor of troops and to encourage them to provide better for their immediate and prospective wants, it is very desirable that in all new reservations arable land be reserved and set apart for post, for hospital and for company gardens; and that ample pasture lands be reserved, sufficient to keep a good stock of milch cows upon.* Wood land is commonly reserved for evident reasons. Troops are at times stationed in sterile districts where little if any arable land, or irrigable land can be available. In such cases it might be advisable to supplement their company funds by transfers from the excess of other and more favored companies, as is done in the case of hospitals. (Par. 1216 Rev. Regulations for the Army, p. 249.) Incidentally this would have a salutary effect in restraining inexperienced company officers from attempting to make any undue saving on the ration.

Greater attention should be given to the raising of fowls, poultry, &c., as is very conveniently done where there are good company gardens, enclosures, &c., &c.; the offal, the parings and kitchen savings, as well as the refuse and surplus in the gardens, would maintain them economically.

The frequent changes of bakers, when detailed soldiers, and their inexperience, often involve great inconvenience and occasionally losses of good material, in the shape of a spoiled batch of flour, which would be obviated if the bakers were employes of experience and skill, on permanent service, paid and employed by the commissary department. Too great attention can hardly be given to these and such other considerations as may tend to increase the comfort, the contentment and the health of the troops; and at this time especially when desertions from the service are so numerous as to call for special comment and investigation as to their probable causes.

After consultation with Surgeon G. Perin, the Medical Director of the Department, with whom the subject of the ration has been discussed, I

*In the farming districts of England even the poorest families keep a cow whenever practicable, or join another family in doing so, either paying for pasture, or, in Yorkshire and Warrickshire, being able to keep the cow in the lanes gratuitously. In several States of the Union the laws forbid cows ranging on the roads or lanes, for pasturage, under penalty of fine and of being "pounded."

unite with him in recommending as a proper ration for the Army the following—

PROPOSED RATION.

22 oz. of Flour, or 22 oz. Soft Bread, except when on fatigue and then to have 24 ounces;

or,

{ 16 oz. of Hard Bread and
4.8 oz. of Flour;

or,

24 oz. of Corn Meal.

20 oz. of Fresh Beef, or other fresh meats; or, 20 oz. Salt Beef;

or,

12 oz. of Pork or Bacon.

2.4 oz. of Beans or Peas, or the equivalent money value in Fresh or Canned Milk, or Cheese.

9.6 oz. of Potatoes, whenever practicable, and when not practicable, the equivalent money value in Fresh or Dried Fruits, such as Apples, Peaches, Prunes and Raisins.

1.6 oz. Rice, or the equivalent money value in Fresh Vegetables, as Onions, Carrots, Parsnips, Turnips, Cabbages; or, Fresh or Dried Fruits,

2.4 oz. Sugar.

1.6 oz. Green, (or 1.28 oz. Roasted) Coffee, or Tea, 2.4 oz.

Candles, Soap, Tea, Vinegar, Salt and Pepper to be issued as at present.

Any savings accruing from the flour, bacon, sugar and coffee shall be expended for articles of equivalent nutritive value as far as practicable; and no savings from the food portion of the ration shall be expendable for anything but food. Any expenditure out of the food savings upon articles of mess or table furniture, utensils, or for anything but food is highly objectionable in itself and leads to various abuses. There are other and better ways of procuring such articles.

An analysis of the nutritive value contained in the water-free solids (27.9659 oz.) of the proposed ration [22. oz. soft bread being issued, and also $\frac{2}{3}$ beef and $\frac{1}{3}$ bacon,] shows:

Articles.	oz.	Albu- minates.	Fats.	Carbo- hydrates.	Salts,
Soft Bread,	22 oz.	1.760	.3300	10.82	.286
Beef, $\frac{2}{3}$, (20 oz.—1.5 deduc- ted for bone—16 oz.) . . .	16 oz.	1.600	.8960	.....	.1707
Bacon $\frac{1}{3}$ of 12 oz., . . . . .		.352	2.9320	.....	.6000
Sugar,	2.4	.....	.....	2.316	.1200
Beans,	2.4	.540	.0480	1.1976	.0576
Potatoes,	9.6	.144	.0096	2.2464	.0480
Rice,	1.6	.080	.0128	1.3312	.0080
Salt,	0.6	.....	.....	.....	.6000
Total,		4.446	4.2284	17.9152	1.3463

Add as accessory—

Coffee extractive, oz. 0.2560.

Total water-free solids, oz. 27.9659.

Nitrogen, grs. 310. Carbon, grs. 5983.

It is recommended that generally the issues conform to this standard, and such will probably be the average in practice; but under exertion, "on fatigue," it will advance by addition of 2 oz. soft bread, in garrison, to albuminates, oz. 4.6360; fats, oz. 4.2584; carbo-hydrates, oz. 18.8992; salts, oz. 1.3723—equal to oz. 29.2659.

And in the field, when hard bread and flour replace the soft bread, it will be: Albuminates, oz. 5.9128; fats, oz. 4.1640; carbo-hydrates, oz. 22.128; salts, oz. 1.4091—equal to oz. 33.6139 water-free solids.

I would recommend that discretion be given the commanding officer, upon the advice of the chief medical officer, to increase the above Ration whenever troops are required to make extraordinary exertion, such as occurs on forced or night marches, or when under prolonged exposure to cold.

I am, General, with much respect,

Your obedient servant,

T. A. McPARLIN,

Surgeon, U. S. A.

MEMORANDUM.—I would respectfully request that this Report on the Army Ration be appended to my Report rendered in obedience to G. O. No. 125, W. D., A. G. O., series of 1874.

